

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Ramon R. Reglos et al.

Assignee: Xilinx, Inc.

Title: Method for Sorting Dice by Speed During Die Bond Assembly and  
Packaging to Customer Order

Serial No.: 09/974,552

Filing Date: 10/09/2001

Examiner: Andre C. Stevenson

Art Unit: 2812

Docket No.: X-887 US

Conf. No.: 7190

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Mail Stop Amendment  
COMMISSIONER FOR PATENTS  
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Alexandria, Virginia 22313-1450

DECLARATION UNDER 37 C.F.R. §1.131

Dear Sir:

I hereby state and declare that I, Alelie T. Funcell, am a joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled, "Method for Sorting Dice by Speed During Die Bond Assembly and Packaging to Customer Order," having Application Serial Number 09/974,552, and filed on October 9, 2001.

I, Alelie T. Funcell, further state and declare that I have reviewed and understand the contents of the above-identified specification, including the claims, and that:

The invention claimed in the above-referenced application was conceived and reduced to practice before September 12, 2001. Attached as Exhibit A is a true and accurate copy of an invention disclosure form that was prepared and witnessed prior to September 12, 2001, and that describes the claimed invention, with the dates redacted.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signed this <sup>14</sup>~~June~~<sup>6th</sup> day of June, 2005, by:

Alelie J. Funcell

Alelie T. Funcell

Witnessed this \_\_\_\_\_ day of \_\_\_\_\_, 2005, by:

Signature: \_\_\_\_\_

Name: \_\_\_\_\_

**EXHIBIT**

**A**



X-887

**Invention Disclosure  
Xilinx Confidential Proprietary**

Title of Invention Method of Sorting Dice by Speed during Die Bond Assembly

\*Determination of inventorship is a legal question that must be made by the Intellectual Property Group. An inventor's signature must include full first, middle, and last name.

*Inventor 1	<u>Ramon Rosal Reglos</u> <small>Inventor's Full Name Including Middle Name</small>	<u>[Redacted]</u> <small>Work Phone</small>	<div style="border: 1px solid black; padding: 2px;"><small>Employee Status</small> <input checked="" type="checkbox"/> Full Time <input type="checkbox"/> Contractor <input type="checkbox"/> Intern</div>
	<u>[Redacted]</u> <small>E-mail Address</small>	<u>[Redacted]</u> <small>Citizenship</small>	
Home Address	<u>[Redacted]</u>		
	<u>[Redacted]</u> <small>Street: Number and Name</small>	<u>[Redacted]</u> <small>City</small>	<u>[Redacted]</u> <small>State</small>
	<u>[Redacted]</u> <small>ZIP Code</small>	<u>[Redacted]</u> <small>Country or Province</small>	
	<u>[Signature]</u> <small>Inventor's Signature</small>	<u>[Redacted]</u> <small>Location &amp; Dept. No.</small>	<u>[Redacted]</u> <small>Date</small>

*Inventor 2	<u>Alelie Tarayao Funcell</u> <small>Inventor's Full Name Including Middle Name</small>	<u>[Redacted]</u> <small>Work Phone</small>	<div style="border: 1px solid black; padding: 2px;"><small>Employee Status</small> <input checked="" type="checkbox"/> Full <input type="checkbox"/> Contractor <input type="checkbox"/> Intern</div>
	<u>[Redacted]</u> <small>E-mail Address</small>	<u>[Redacted]</u> <small>Citizenship</small>	
Home Address	<u>[Redacted]</u>		
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	<u>[Redacted]</u> <small>ZIP Code</small>	<u>[Redacted]</u> <small>Country or Province</small>	
	<u>Alelie Funcell</u> <small>Inventor's Signature</small>	<u>[Redacted]</u> <small>Location &amp; Dept. No.</small>	<u>[Redacted]</u> <small>Date</small>

*Inventor 3	<u>[Redacted]</u> <small>Inventor's Full Name Including Middle Name</small>	<u>[Redacted]</u> <small>Work Phone</small>	<div style="border: 1px solid black; padding: 2px;"><small>Employee Status</small> <input type="checkbox"/> Full/Part-Time <input type="checkbox"/> Contractor <input type="checkbox"/> Intern</div>
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	<u>[Redacted]</u> <small>Inventor's Signature</small>	<u>[Redacted]</u> <small>Location &amp; Dept. No.</small>	<u>[Redacted]</u> <small>Date</small>

*Inventor 4	<u>[Redacted]</u> <small>Inventor's Full Name Including Middle Name</small>	<u>[Redacted]</u> <small>Work Phone</small>	<div style="border: 1px solid black; padding: 2px;"><small>Employee Status</small> <input type="checkbox"/> Full/Part-Time <input type="checkbox"/> Contractor <input type="checkbox"/> Intern</div>
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	<u>[Redacted]</u> <small>Inventor's Signature</small>	<u>[Redacted]</u> <small>Location &amp; Dept. No.</small>	<u>[Redacted]</u> <small>Date</small>

<b>*Inventor 5</b>	_____ <i>Inventor's Full Name Including Middle Name</i>	_____ <b>Work Phone</b>		_____ <b>Employee Status</b> <input type="checkbox"/> Full/Part-Time <input type="checkbox"/> Contractor <input type="checkbox"/> Intern
	_____ <b>E-mail Address</b>	_____ <b>Citizenship</b>		
<b>Home Address</b>	_____ <i>Street: Number and Name</i>	_____ <i>City</i>	_____ <i>State</i>	_____ <i>ZIP Code</i>
	_____ <i>Inventor's Signature</i>			_____ <i>Country or Province</i>
	_____ <i>Location &amp; Dept. No.</i>			_____ <i>Date</i>

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<b>*Inventor 6</b>	_____ <i>Inventor's Full Name Including Middle Name</i>	_____ <b>Work Phone</b>		_____ <b>Employee Status</b> <input type="checkbox"/> Full/Part-Time <input type="checkbox"/> Contractor <input type="checkbox"/> Intern
	_____ <b>E-mail Address</b>	_____ <b>Citizenship</b>		
<b>Home Address</b>	_____ <i>Street: Number and Name</i>	_____ <i>City</i>	_____ <i>State</i>	_____ <i>ZIP Code</i>
	_____ <i>Inventor's Signature</i>			_____ <i>Country or Province</i>
	_____ <i>Location &amp; Dept. No.</i>			_____ <i>Date</i>

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<b>*Inventor 7</b>	_____ <i>Inventor's Full Name Including Middle Name</i>	_____ <b>Work Phone</b>		_____ <b>Employee Status</b> <input type="checkbox"/> Full/Part-Time <input type="checkbox"/> Contractor <input type="checkbox"/> Intern
	_____ <b>E-mail Address</b>	_____ <b>Citizenship</b>		
<b>Home Address</b>	_____ <i>Street: Number and Name</i>	_____ <i>City</i>	_____ <i>State</i>	_____ <i>ZIP Code</i>
	_____ <i>Inventor's Signature</i>			_____ <i>Country or Province</i>
	_____ <i>Location &amp; Dept. No.</i>			_____ <i>Date</i>

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<b>*Inventor 8</b>	_____ <i>Inventor's Full Name Including Middle Name</i>	_____ <b>Work Phone</b>		_____ <b>Employee Status</b> <input type="checkbox"/> Full/Part-Time <input type="checkbox"/> Contractor <input type="checkbox"/> Intern
	_____ <b>E-mail Address</b>	_____ <b>Citizenship</b>		
<b>Home Address</b>	_____ <i>Street: Number and Name</i>	_____ <i>City</i>	_____ <i>State</i>	_____ <i>ZIP Code</i>
	_____ <i>Inventor's Signature</i>			_____ <i>Country or Province</i>
	_____ <i>Location &amp; Dept. No.</i>			_____ <i>Date</i>

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<b>*Inventor 9</b>	_____ <i>Inventor's Full Name Including Middle Name</i>	_____ <b>Work Phone</b>		_____ <b>Employee Status</b> <input type="checkbox"/> Full/Part-Time <input type="checkbox"/> Contractor <input type="checkbox"/> Intern
	_____ <b>E-mail Address</b>	_____ <b>Citizenship</b>		
<b>Home Address</b>	_____ <i>Street: Number and Name</i>	_____ <i>City</i>	_____ <i>State</i>	_____ <i>ZIP Code</i>
	_____ <i>Inventor's Signature</i>			_____ <i>Country or Province</i>
	_____ <i>Location &amp; Dept. No.</i>			_____ <i>Date</i>

[REDACTED]

[REDACTED]

The information requested below may serve as the basis for a patent application, therefore be as complete and as accurate as possible. Please describe your invention below, and, if necessary add pages and supporting drawings.

1. Abstract of the Invention — In a few sentences, briefly describe what your invention is and what it does.
To incorporate "die speed sorting" capability into multiple package types/carriers during DIE BOND
assembly process. This feature will provide the flexibility to process selective die speed within a wafer. The
die attach machine can be programmed to DIE BOND different "die speed" on one package type or die
bond different "die speed" on different package types. The die attach machine will have capability to be
programmed to Die Sort and transfer all other dice per speed grade into separate waffle packs/die carriers to
enable die-storage for future assembly builds.
- See attached diagram/flow#1

2. **Background Information** — Provide sufficient background information so that the function and novelty of your invention can be understood. What techniques prior to your invention were used to perform the function of your invention, and what are the disadvantages? What problem is solved by your invention? What are the advantages of your invention over the prior techniques?

Customer places order with specified speed grade. All good pre-sorted dice with different speed grades in the wafer are die bonded onto a single output ; one selected package. Speed grade sorting is done after package assembly, at Final Electrical Test. Parts are marked per speed grade which is an additional step. Tested units that meet customer speed grades are shipped and other units with different speed grades are stored in Finished Goods Inventory..

The disadvantages of the current process are:

1. Excessive inventories of packaged products with different speed grades.
2. Shortage of packaged products with required speed grade
3. Extra labor to add the speed grade on the package during Final test
4. Speed grade is pre-marked at assembly according to mark instructions. All units in a wafer maybe be marked as one speed grade knowing that there are different speed grade within the lot. The intent is to assemble enough units to support customer orders on time. If there are extra units from the lot after electrical, the units are stored in Finished Goods inventory. There are times when product markings are erased and re-marked for speed-down grade to meet customer shipments.

**Problem solved:**

1. Enables die-storage with specific-speed grade vs keeping inventory at Finished Goods. Therefore, lower inventory cost.
2. Supports Build To Order flow efficiently/effectively
3. Improved cycle time. Speed grade is pre marked in assembly, eliminate marking after electrical test
4. Products with pre-mark speed grade will be processed through Finished Goods, No Bin inventory required
5. Eliminate rework/remarking

3. **Detailed Description** — (a) Describe the structural and functional operation of your invention. Use drawings, graphs, or flowcharts as needed to describe your invention. Give specific details, not just general information. Point out what improvements your invention incorporates or the superior performance which is obtained and why it is obtained. (b) Are there any alternative methods or different structural embodiments of your invention? Can the general idea or technique of your invention be extended to other related fields? (c) Which features are believed to be the novel features (be specific)? (d) How could you prevent competitors from circumventing your invention?

- A) Incorporate Die Speed Sorting at Die Bond Process and eliminate Speed Sorting at Electrical Test. See abstract of inventions item 1 above.
- B) Allows Die Attaching on same package but different Bonding to multiple package types or pin counts , multiple die-waffle packs per speed grade.
- C) Incorporate " Die Speed Sorting at Die Bond Process, Eliminate Speed Sorting at Electrical Test
- D) Xilinx will design this equipment with a Die Attach equipment manufacturer. We will arrange agreement for proprietary use of this equipment. Eventually, similar versions may become available in the industry. Through this patent, we hope we can slow down copy cats.

4. List and attach a copy of the most pertinent publications (articles, app notes, patents, patent applications, invention disclosures, etc.) to your invention that are known to you.

Die Attach Process Patents.

5. The witnesses should read and understand the disclosure and sign in the appropriate spaces below. The inventors and witnesses should initial and date each added page of disclosure.

Witness

Date

Witness

Date

Prepared By

Date

To be filled in by the ENGINEERING or MARKETING/PRODUCT MANAGER or equivalent. Use separate sheets as required. THE MANAGER(S) IN SIGNING THIS FORM ATTEST THAT THEY UNDERSTAND THE INVENTION.

What is the market for products incorporating this invention?



Discuss the business impact that this invention will have on Xilinx. Be Specific and Quantitative.

Engineering Manager's Name/Title (Type or Print)

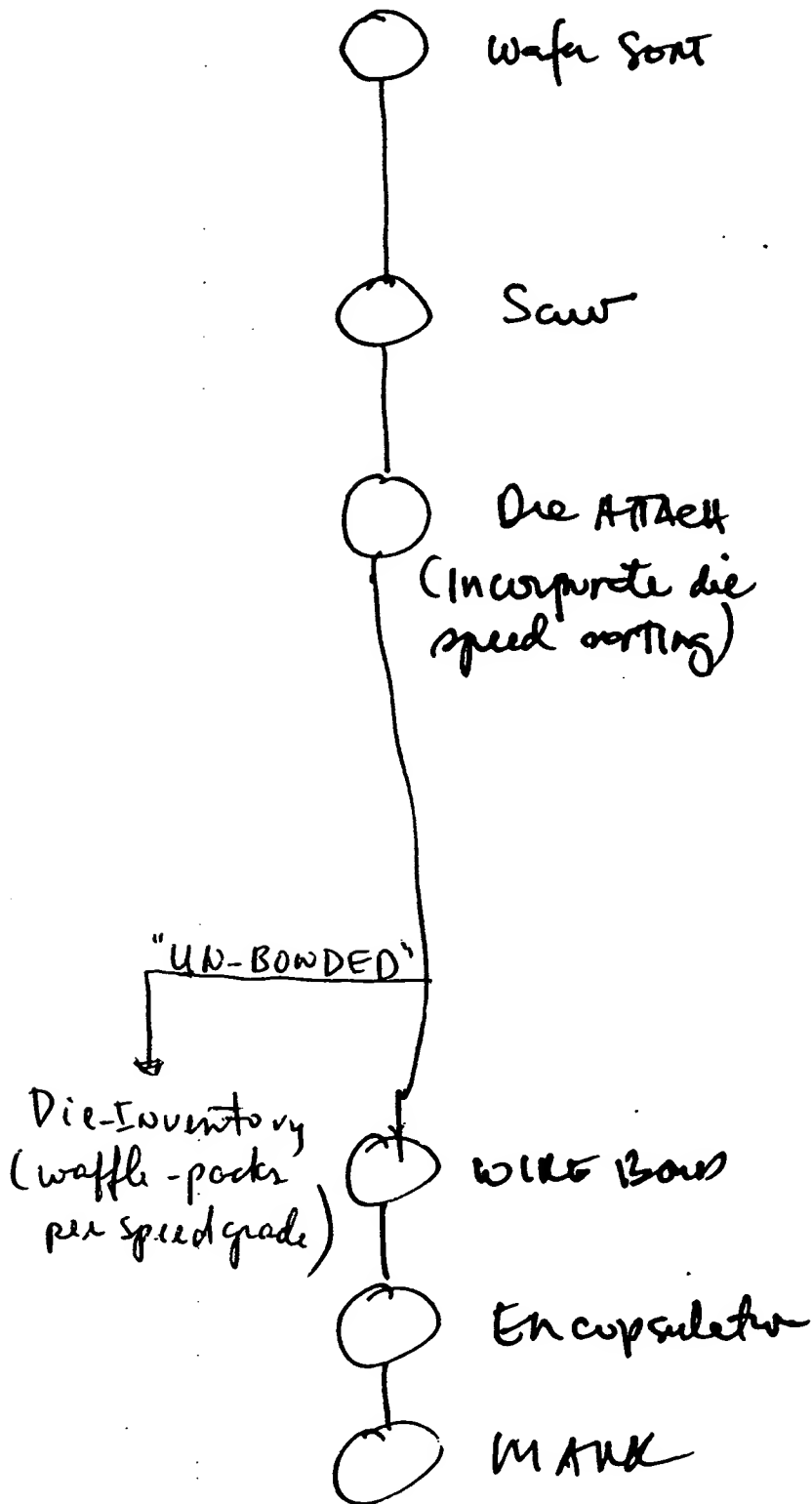
Signature

Date

Dept No.

Phone

# Inventions:



good die, speed grade is stored in wafer map file

Die/cut individual die, wafer map is intact

Using wafer map, the border is programmed to identify units w/ different speed grades i.e.,

- Pick and attach selected speed grade on one package type.
- Pick and attach different speed grades on one package type, offloaded 1-speed grade, pkg. type.
- Transfer unused die of different speed grade into the container for future assembly build, segregated per speed grade.
- Pick and attach chosen speed grade to multiple pkg type or the same pkg type but different pin-count

P. Echols



Electrical TEST

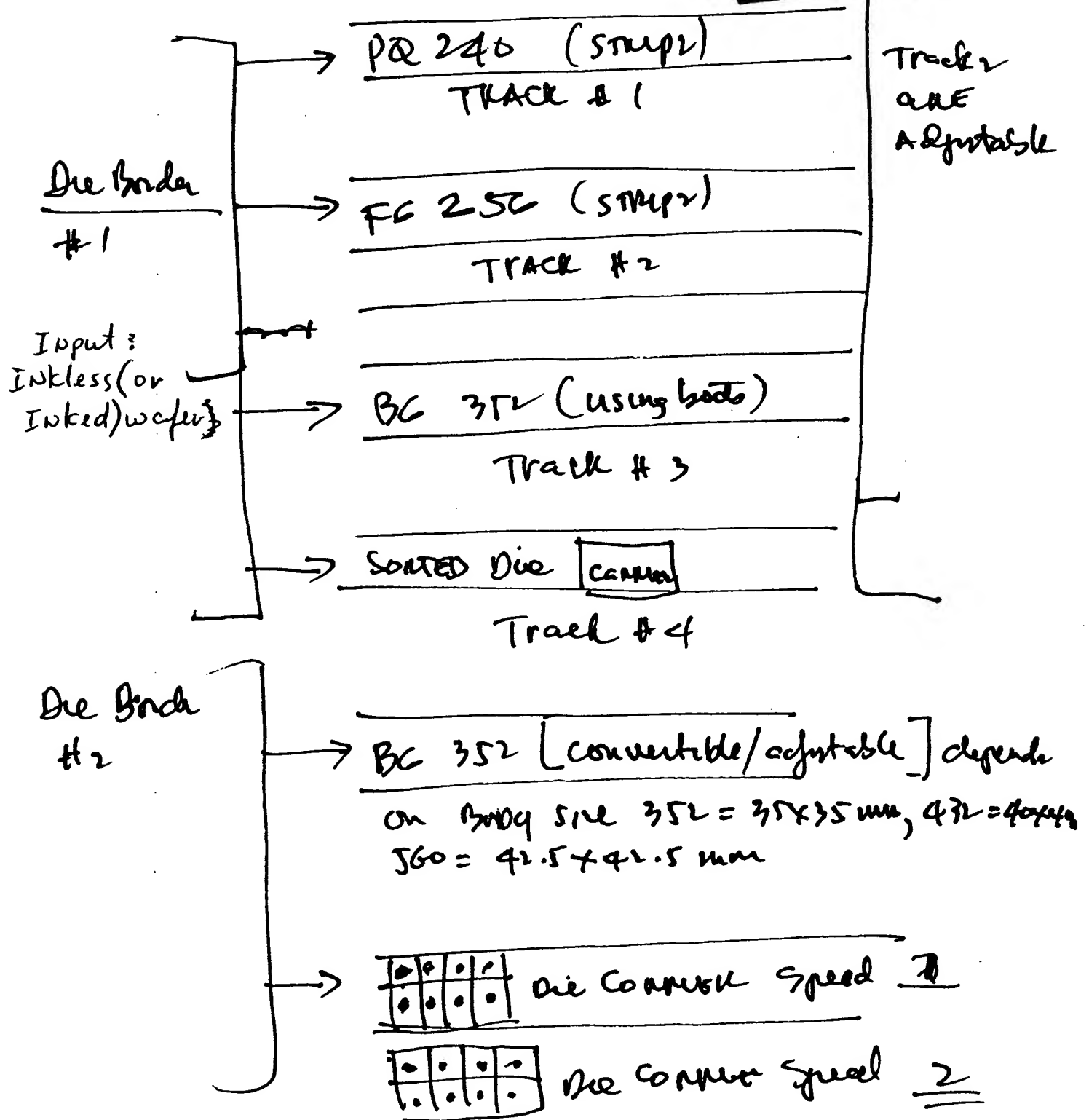


Ship

# Diagram #1

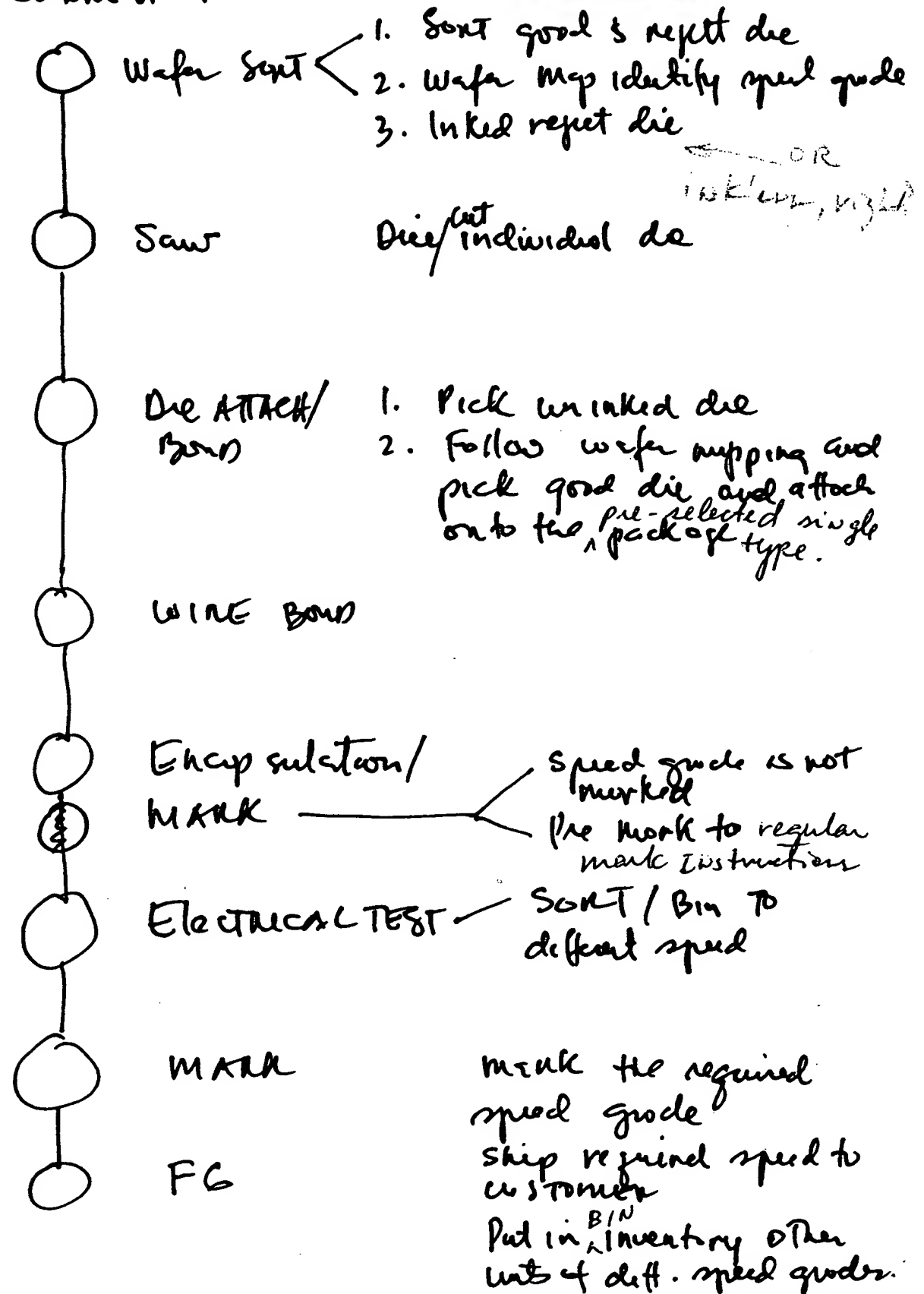
Pl. McGloos

OUTPUT:





# Current Process



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